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XV. *Chermes Lacca*. By William Roxburgh, M. D. of Samulcotta. Communicated by Patrick Russell, M. D. F. R. S.

Read May 19, 1791.

SOME pieces of very fresh-looking lac, adhering to small branches of *Mimosa cinerea* *, were brought me from the mountains, on the 20th of November, 1789. I kept them carefully in wide-mouthed crystal bottles, slightly covered; and this day, the 4th of December, fourteen days from the time they came from the hills, thousands of exceeding minute red animals were observed crawling about the lac and the branches it adhered to, and still more were issuing from small holes on the surface of the cells. By the assistance of glasses, small imperforated excrescences were also observed, interspersed among these holes, two, regularly, to each hole, crowned with some very fine white hairs, which being rubbed off, two white spots appeared. The animals, when single, ran about pretty briskly; but, in general, on opening the cells, they were so numerous as to be crowded over one another. The substance of which the cells were formed cannot be better described, with respect to appearance, than by saying it is like the transparent amber that beads are made of. The external covering of the cells may be about half a line thick, is remarkably strong, and able to resist injuries: the partitions are much thinner. The cells are in general irregular squares, pentagons, and hexagons, about an

* Lac, on this coast, is always found upon the three following species of *Mimosa*; 1st, a new species, called by the Gentoos *Conda corinda*; 2d, *Mimosa glauca* of Kœnig; and, 3dly, *Mimosa cinerea* of LINNÆUS.

eighth of an inch in diameter, and a quarter of an inch deep: they have no communication with each other. All those I opened, during the time the animals were issuing from them, contained in one side, and which occupied half the cell, a small bag, filled with a thick red jelly-like liquor, replete with what I take to be eggs. These bags, or utriculi, adhere to the bottom of the cells, and have each two necks, which pass through perforations in the external coat of the cells, forming the before-mentioned excrescences, ending in some very fine hairs.

The other half of the cells have a distant opening, and contain a white substance, like some few filaments of cotton rolled together, and a number of the little red insects themselves crawling about, ready to make their exit. Their portion of each cell is about a half; and, I think, must have contained near one hundred of these animals. Other cells, less forward, contained in this half with one opening, a thick, red, dark blood-coloured liquor, with numbers of exceedingly minute eggs, many times smaller than those found in the small bags which occupied the other half of the cells. Several of these insects I observed to have drawn up their legs, and to lie flat; they did not move on being touched; nor did they shew any signs of life upon the greatest irritation*.

Dec. 5. The same minute hexapodes continue issuing from their cells in numbers.

Dec. 6. The male insect, I have found to-day, at least what I think is such. A few of them are constantly running about, and over the little red insects, (which I shall now call the female) most actively: as yet they are scarce, not more, I imagine, than 1 to 5000 females, but they are four or five times their size.

* It will appear in the sequel, that these were on the point of transformation into the pupa state.

To-day the female insects continue issuing in great numbers, and move about as before.

Dec. 7. The small red or female insects, are still more numerous, and move about as before. The winged or male insects, are still very few, but continue active. There have been fresh leaves and bits of the branches of *Mimosa cinerea*, and *Mimosa intia*, put in to them. They go over them indifferently, without shewing any preference or inclination to work, or to copulate. I opened a cell, from whence I thought the winged flies had come, and found several (eight or ten) struggling to shake off their incumbrances. They were in one of those utriculi mentioned before, which end in two mouths, shut up with fine white hairs; but one of them was open for the exit of the flies; the other would, no doubt, have opened in due time. This utriculus I found now perfectly dry; and could plainly see it was divided into minute cells, by exceedingly thin membranous partitions. I imagine, before any of the flies made their escape, it might have contained about sixteen or twenty. In the minute cells, with the living flies, or from whence they had made their escape, were small dark-coloured compressed grains.

March 26, 1790, I found some branches of the same sort of *Mimosa*, with numbers of the minute red hexapodes, mentioned in December (seemingly in their pupa state), adhering to them. They are of various sizes, from half a line to a line and a half in length. I found many of the large ones empty. They have a round opening at the lower end, with a small round operculum, or lid, which now loosely covers the empty husk or shell: the inside of these is lined with a small white membrane; others were still shut, some were opening, and some half open, with the insects projecting more or less, and soon extricating themselves entirely.

I opened

I opened some of the middle-sized, and found they contained a thick, deep blood-coloured liquid; others, still larger, put on the appearance of the fly, which was soon to issue, retrograde.

Description of the male lac insect in its perfect state.

It is then about the size of a very small fly, and exceedingly active; the larva and pupa state, I am as yet unacquainted with.

Head obtuse; between the eyes a beautiful, shining green.

Eyes, black, very large in proportion to the animal.

Antennæ, clavated, feathered, about two-thirds the length of the body; below the middle, an articulation, such as those in the legs.

Mouth: I could not distinctly see it.

Trunk, oval, brown.

Abdomen, oblong, length of the trunk and head.

Extremities. Vide p. 232.

Legs, six; with them it runs briskly, and jumps actively.

Wings, four, membranaceous, longer than the abdomen, incumbent; the anterior pair twice the size of the posterior.

Tail, none.

Description of the female lac insect.

Larva, red, very minute, requiring a good lens to distinguish its parts.

Head, scarcely to be distinguished from the trunk.

Antennæ, filiform, bifid, hairy, length of the insect.

Eyes: in the back part of the trunk are two minute elevations, which may be they.

Mouth,

Mouth, on the middle of the breast, between the first pair of legs, which the little animal projects on being injured, otherwise it cannot be seen.

Trunk and Abdomen, oblong, compressed, tapering equally towards each end, crossed with twelve annular segments, margins very flat, and seem to be marked with a double line.

Extremities.

Legs, six, running, does not jump.

Wings, none.

Tail, two slender white hairs, as long as the antennæ, with a white point, which may be called the rump, between them.

Pupa: the duration and peregrinations of the larvæ seem very short and confined; for, in a few days after issuing from their cells they fix themselves on the small, but hard, woody branches of the tree they were produced on; it seeming impossible that they can in this state transport themselves to any other. About the end of December, or beginning of January, they have done issuing from their cells, and are sticking fast to the branches, regularly with their heads towards the extremity of the branch. The legs, antennæ, and tail, are now entirely gone. Their progress through this state is slow, requiring about three months. Soon after they have settled themselves, they become covered with a hard, brittle, garnet-coloured crust, similar to the lac of which the cells are made, but of a brighter colour. They retain only a rude resemblance of their former shape. About the end of March they have acquired three or four times their original size; a small, round lid or cover is now observed at the lower part, which opens, but does not always fall off, and gives a retrograde passage for the fly, now in its perfect state.

The

The insect in its perfect state is rather smaller than the male, of a brighter red colour, and less active.

Head, small in proportion to the body, pointed.

Eyes, very minute.

Antennæ, filiform, not articulated as in the male, spreading, somewhat shorter than the insect.

Mouth: I could not discover it distinctly.

Trunk, red, almost orbicular.

Abdomen, red, oblong, composed of twelve annular segments.

Extremities.

Legs, six, for running or jumping.

Wings, two, incumbent, longer than the abdomen, transparent.

Tail, two white hairs as long as the insect.

With regard to the œconomy of these little animals, I must, for the present, be silent; having little more than conjecture to offer on that head.

The eggs, and dark-coloured glutinous liquor they are found in, communicate to water a most beautiful red colour, while fresh. After they have been dried, the colour they give to water is less bright; it would therefore be well worth while for those, who are situated near places where the lac is plentifully found, to try to extract and preserve the colouring principles by such means as would prevent them from being injured by keeping. I doubt not but in time a method may be discovered to render this colouring matter as valuable as cochineal.

Mr. HELLÖT's process for extracting the colouring matter from dry lac deserves to be tried with the fresh lac in the month of October, or beginning of November, before the insects have acquired life; for I found the deepest and best colour was procured from the eggs while mixed with their nidus.

His process is as follows. Let some powdered gum lac be digested two hours in a decoction of comfrey root, by which a fine crimson colour is given to the water, and the gum is rendered pale or straw coloured. To this tincture, poured off clear, let a solution of alum be added; and when the colouring matter has subsided, let it be separated from the clear liquor and dried; it will weigh about one fifth of the quantity of lac employed. This dried fecula is to be dissolved or diffused in warm water; and some solution of tin is to be added to it, by which it acquires a vivid scarlet colour. This liquor is to be added to a solution of tartar in boiling water; and thus the dye is prepared.

In India comfrey roots are not to be had; but any other mucilaginous root, gum, or bark, would probably answer equally well. On some parts on the Coromandel coast, if not over it all, a decoction of the seeds of a very common plant (*Cassia tora* of LINNÆUS), which is exceedingly mucilaginous, is used by the dyers of cotton cloth blue, to help to prepare the blue vat. It suspends the indigo till a fermentation takes place to dissolve it, and also helps to bring about that fermentation earlier than it otherwise would. The gum lac (or rather resin) itself is known to be perfectly soluble in spirits of wine. The empty husks which covered the pupa are also soluble in spirits, but without a very large proportion of the spirits is used, it soon becomes thick, like a jelly. Four grains communicated that quality to three drams of rectified spirits of wine. This jelly is very difficult of solution in spirits; a month has not effected it in a heat of from 80 to 90 degrees of FAHRENHEIT'S scale. The substance of which these husks are composed, is an exudation from the larvæ themselves, which becomes hard by exposure to the air. The cells seem

to be made of a very different substance; what that is, and the manner in which they are made, remains still to be discovered.

Explanation of the figures. Tab. VI.

1. A piece of lac on a small branch of *Mimosa cinerea*, natural size.

2. The outside of the top of a cell, with its three openings; the white one with the hairs is still unopened.

3. One of the utriculi for the male flies, with its two necks, which correspond with the two upper apertures in fig. 2.

4. One of the eggs found in the utriculus, fig. 3. which produces the male flies.

5. The male fly in its perfect state.

6. Small compressed dry grains, found in the cellulae with the male flies. The last five figures are all much magnified.

7. A small bit of a branch of *Mimosa cinerea*, with the female insects in their pupa state, natural size.

8. One of the eggs which produce the female larva. They are always in that portion of the cell from whence the larva issues.

9. The female larva.

10. ——— pupa.

11. ——— with the lid opening, and the insect protruding.

12. The female fly in its complete state.

The last five figures are much magnified.

